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(71) Applicant (for all designated States except US): NEU-
ROSTREAM TECHNOLOGIES, INC. [CA/CA]; 241
Strong Road, Anmore, British Columbia V3H 3C8 (CA).

(72) Inventor; and

(75) Inventor/Applicant (for US only): HOFFER, Joaquin,
Andres [CA/CA]; 241 Strong Road, Anmore, British Co-
lumbia V3H 3C8 (CA).

(74) Agent: KONDOR, George, F.; Oyen Wiggs Green & Mu-
tala, 480 - 601 West Cordova Street, Vancouver, British Co-
lumbia V6B 1G1 (CA).

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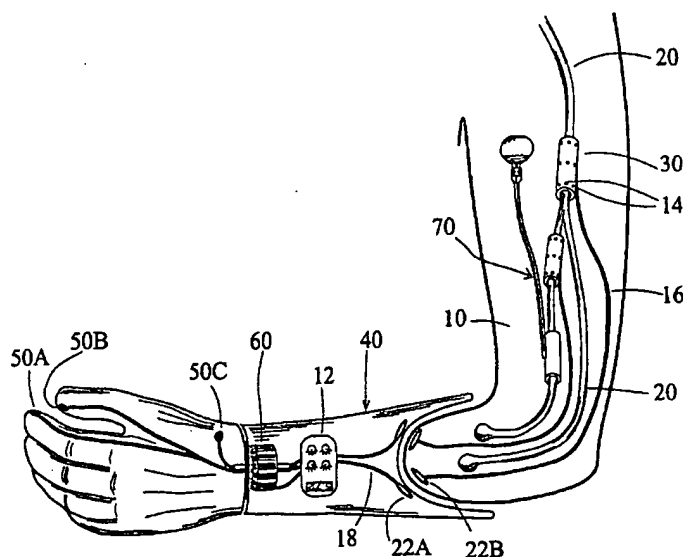
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For two-letter codes and other abbreviations, refer to the "Guid-
ance Notes on Codes and Abbreviations" appearing at the begin-
ning of each regular issue of the PCT Gazette.

(54) Title: ELECTRICAL STIMULATION SYSTEM FOR TREATING PHANTOM LIMB PAIN



(57) Abstract: This invention relates to a system and methods for relieving phantomlimb pain in amputees, and for providing an amputee with sensory feedback from a prosthetic limb (40). The system employs implantable multichannel, multi-chambered interface structures, namely, nerve cuffs (30). The implanted nerve cuffs have electrodes (14) which transmit electrical signals generated by a signal generator (12) to nerves (20), recruiting certain neurons to send sensory signals to the cerebral cortex, suggesting sensory sensations to the amputee. Such signals can arise directly from the signal generator, approximating the train of signals seen by the cortex in a normally innervated limb, or can originate from sensors (50A-c) in a prosthetic limb.

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/CA 00/00789

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 A61N1/34

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A61N A61F A61B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 232 679 A (SCHULMAN JOSEPH H) 11 November 1980 (1980-11-11) column 1, line 11 -column 3, line 28 column 4, line 26 - line 49; figures ---	1,19
A	US 5 824 027 A (CHEN YUNQUAN ET AL) 20 October 1998 (1998-10-20) cited in the application column 5, line 60 -column 7, line 53; figures ---	1,2,12, 19
A	US 5 851 223 A (LITVINOV GRIGORIY S ET AL) 22 December 1998 (1998-12-22) column 3, line 41 -column 4, line 56 column 10, line 47 -column 11, line 12; figures --- -/--	1,19

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

A document defining the general state of the art which is not considered to be of particular relevance

E earlier document but published on or after the international filing date

L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

O document referring to an oral disclosure, use, exhibition or other means

P document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

G document member of the same patent family

Date of the actual completion of the international search

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Date of mailing of the international search report

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Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040. Tx. 31 651 epo nl.
Fax: (+31-70) 340-3016

Authorized officer

Rakotondrajaona, C

INTERNATIONAL SEARCH REPORT

International Application No
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 98 25552 A (SCHWABE G BLAINE IV ;SABOLICH JOHN A (US); NOVACARE ORTHOTICS AND) 18 June 1998 (1998-06-18) page 5, line 33 -page 8, line 30 page 24, line 28 -page 25, line 38; figures ---	12,13, 15,16
A	US 5 413 611 A (HASLAM II THOMAS P ET AL) 9 May 1995 (1995-05-09) column 2, line 61 -column 4, line 14; figures ---	12,13, 15,16
A	DE 44 04 842 A (FOSS PIERRE NICOLAS DR MED) 17 August 1995 (1995-08-17) abstract -----	1,19

INTERNATIONAL SEARCH REPORT

international application No.
PCT/CA 00/00789

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☒ Claims Nos.: 11, 18
because they relate to subject matter not required to be searched by this Authority, namely:
Rule 39.1(iv) PCT - Method for treatment of the human or animal body by therapy
2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☒ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-10, 19

Electrical stimulation system for treating phantom limb pain in an amputee having a limb stump, comprising :

- a) a plurality of electrodes implanted in said limb stump,
- b) an electrical signal generator for providing each electrode with varying signals.

2. Claims: 12-17

A system for providing sensory feedback from a prosthetic limb to an amputee having a limb stump, comprising :

- a) a prosthetic limb having a plurality of sensors for sensing states of touch, or pressure, or force, or slip, or joint position or temperature,
- b) a signal transducer for transducing the sensor signals
- c) a multi-chambered nerve cuff implanted in said limb stump,
- d) means for communicating the electrical signals to a predetermined electrode in said nerve cuff.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/CA 00/00789

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4232679 A	11-11-1980	DE 2803366 A FR 2379104 A	27-07-1978 25-08-1978
US 5824027 A	20-10-1998	AU 8846798 A WO 9908746 A EP 1001827 A	08-03-1999 25-02-1999 24-05-2000
US 5851223 A	22-12-1998	US 5571149 A US 5109847 A US 5421817 A	05-11-1996 05-05-1992 06-06-1995
WO 9825552 A	18-06-1998	AU 5372398 A EP 0964661 A	03-07-1998 22-12-1999
US 5413611 A	09-05-1995	NONE	
DE 4404842 A	17-08-1995	NONE	